

## **Vitamin D deficiency is associated with inflammatory cytokine concentrations in patients with diabetic foot infection.**

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#### **Abstract**

Vitamin D has been recognised as a potent immunomodulator and its deficiency is common in different population groups including patients with diabetic foot infection. Diabetic footinfection reflects the altered immune status of the host. As cytokine regulation plays a significant role in infection and wound-healing processes, the present study aimed to evaluate the association between vitamin D status and inflammatory cytokine profiles in patients with diabetic foot infection. The serum concentrations of vitamin D (25-hydroxyvitamin D), IL-1 $\beta$ , IL-6, TNF- $\alpha$  and interferon- $\gamma$  (IFN- $\gamma$ ) were measured in 112 diabeticfoot infection cases and 109 diabetic controls. Severe vitamin D deficiency (25-hydroxyvitamin D concentration < 25 nmol/l) was more common in cases than in controls (48.2 v. 20.5%). Although age, duration of diabetes, HbA1C (glycosylated Hb) concentration and BMI were similar, cases had significantly higher concentrations of IL-6 ( $P \leq 0.001$ ), IL-1 $\beta$  ( $P \leq 0.02$ ) and TNF- $\alpha$  ( $P \leq 0.006$ ) than controls. A significant negative correlation was also observed between 25-hydroxyvitamin D concentration and circulating concentrations of IL-1 $\beta$  ( $r -0.323$ ;  $P \leq 0.001$ ) as well as IL-6 ( $r -0.154$ ;  $P \leq 0.04$ ), but not between 25-hydroxyvitamin D and TNF- $\alpha$  and IFN- $\gamma$  concentrations. Furthermore, a significant difference in IL-1 $\beta$  ( $P \leq 0.007$ ) and IL-6 ( $P \leq 0.02$ ) concentrations was observed in patients with severe 25-hydroxyvitamin D deficiency compared with patients with 25-hydroxyvitamin D concentration  $\geq 25$  nmol/l, and this difference was remarkable for TNF- $\alpha$ . In conclusion, severe vitamin D deficiency is associated with elevated inflammatory cytokine concentrations in diabetic patients, particularly in those with foot infection. A 25-hydroxyvitamin D concentration value < 25 nmol/l is suggested as the 'cut-off' for such immunological alterations in patients withdiabetes mellitus.

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